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PAPAIPEMA STENOSCELIS DYAR, A RARE NOCTUID OF THE EASTERN UNITED STATES. (LEPIDOPTERA).

BY HENRY BIRD,

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When the foodplant is known as well as some outlook on biological happenings, *Papaipema* species for the most part are quite easily secured when bred through to the adults. To meet with them other than larvae or pupae is another matter, and except for a few, they classify as uncommon insects.

The species *stenoscelis* is a beautiful little moth with a wing expanse of 30 to 38 mm. The primaries have rich brown markings on a yellowish field, permeated with a more or less purplish tone, whereupon two upright, linear white stigmata stand out contrastingly and offer suggestion for the applied name. It has not been illustrated in American literature, but abroad both Hampson and Seitz have figured it in color. Dyar's unique type was secured through a purchase of moths and this particular specimen was known to have been taken in the environs of Baltimore, Maryland, the description appearing in 1907. So far as can be gathered this was the first specimen taken. How can it be that such a striking moth escaped notice through those prior years when so much ardent collecting had been done already along this section of the Atlantic seaboard? Truly, *stenoscelis* must be a rare moth.

A brief note on the biological features and the foodplant appeared in this magazine in 1913. Even with this attendant advantage, and since that time it has been industriously sought, a census to date indicates but four examples taken at light, including presumptively the type, and less than a score reared. No other eastern species of the genus where the foodplant is known can compare in such elusiveness. And the fact that the larvae are not scarce nor difficult to locate when properly pursued, adds challenge to the questions involved.

Anchistia (*Woodwardia*) *virginica* (L.), the only known foodplant, is not a rare fern even though particularly restricted, being a denizen of wet, acid soil conditions, often growing in standing water for a greater portion of the year. It also exists, though not so robustly, in drier situations which yet retain a sufficient modicum of acidity. Pine barren areas, sphagnum swamps, cranberry bogs, sections where the ground water runs brown with suspended tannin, such bespeak the presence of the Virginia Chain-fern. According to the generalized references of botanies, it ranges our entire coastal area including Nova Scotia, and southwestward to Arkansas. Fittingly, this fern and this moth, both being generically American, offer an example of endemic combination although the actual apprehension of the latter so far has been only from Massachusetts to Maryland. The creeping root is as much as 15 mm. in diameter and it is here *stenoscelis* larvae pass most of their career.

Several centimeters under the surface the advancing root-apex maintains an horizontal position and in the course of many years a circumscribed area may become a perfect stand of the plant, development of a single individual. Such stability of a foodplant station conforms agreeably to the inactive habits of this group of moths, but it also works advantageously for the parasites. Hence there frequently arises a very localized, ecological complex where a host plant and a host larva whose parasites are themselves hosts to secondary followers, constitute an interrelated community wherein *stenoscelis* fares by far the worst. Even though it is a gross feeder and mines a considerable portion of the widely running root, the larva does little permanent injury to the plant.

Such evidence as pertains to the scarcity of this moth must be gleaned from the preparatory stages and due to environment, this is not so easy as with some allies. Only surmise can be offered as to the lethal agencies operating against the over-wintering ova and the newly hatched larvae, but they must be great, due to the attendant wetness. The first autopical evidence begins when a lucky, first stage larva ensconces itself in the midrib of the frond tip. Only the adjacent pinnae turn brown and in this restricted quarters, occupied until the beginning of the third stage usually, the larvae becomes a target for the majority of its hymenopterous foes. When these quarters becqme too confined the larva descends the frond stem to near the base or at least above water level where it enters, and boring downward to the commodious root yet maintains the entrance opening for disposing frass. The viviparous dipteron, *Lydella* (*Masicera*) *senilis* Meig. has then opportunity for larviposition at the aperture, to which it might be easily directed by odor of the frass, and this fly occasionally figures in lesser parasitic role. While the opening is too small for it to enter, the ejected larva can be placed therein and finds attachment to its host when it backs frequently to the orifice. By mid-August the gallery will have advanced and a new outlet is required. This is usually a droughty period of the year and there is less effort to keep the ventilator at a high level. However, heavy showers cause temporary inundations and may account for some mortality. As with many of the allies, the posterior pair of spiracles is largest and with this very attenuated larva it is possible to back up the boring in the slender frond base which suggests this modification may be of avail at times.

Parapamea buffaloensis Grt., a close ally and a rather more successful species, endures a similar contentious condition when mining its foodplant root, the semi-aquatic *Saururus cernuus* L. This species pupates in the stem or base and suffers much from the depredations of those large *Amblyteles* or *Ichneumon* species which operate on either the pupae, or the larvae in their prepupal lethargy. The fern feeder generally pupates in the soil and thus escapes these ruthless enemies. Indeed, the number of parasitic species operating against the latter seem comparatively limited, an *Apanteles*, but not *A. papaipemae* Muese., and another not far removed generically are common and very potent. Such genera as commonly deplete the congeners, *Microplitis*, *Bassus*, *Microbracon* and others, have not been met though conditions seem to warrant their vulnerability. It should be pointed out that the mention of an *Hemiteles* parasite in the 1913 paper concerns one in a secondary, rather than a primary role.

Purposing to gain a greater accuracy of detail, one hundred larvae removed from the field hazard at third stage were reared with but little trouble to maturity but gave perfect adults to only five per cent. Being thus protected for more than half their presumed career of about seventy days and subject to no aquatic vicissitudes, yet this low percentage follows. These results were a summary of three seasons observations, not that of a single year wherein special adverse conditions might have prevailed. While a fifty per cent parasitism may be accepted for these stages of the larval period, yet obscure fungus or other diseases decimate them to an almost equal degree and seems to offer a comparable parallel of vague control as with certain plants which are kept within distributional confines by plant diseases rather than that any noteworthy feature of isotherms, soil, moisture or dryness enters into consideration. So, while the deduction can be vouchsafed that we have to do with a very uncommon adult moth, the reasons therefore are yet much beclouded. We know so little of our entire insect fauna, of their natural behavior and impinging hazards that the garnering of some of these facts ought to beckon us readily from the library shelves out into the open.

The accompanying illustration shows an ideal station for *Anchistia virginica* and habitat for *stenoscelis,* where almost shoulder high, these lush ferns are furnishing larval examples discussed by the Honorable George de Ghika (left) who is widely acquainted with similar endophytic species in Europe. Formerly a sphagnous bog, this area gives indication of declining acidity in the advent of occasional Typha specimens and may ultimately change greatly in character, a fate to which even "climax" flora in time succumbs.

REVIEW OF TULARAEMIA IN BRITISH COLUMBIA, WITH SPECIAL REFERENCE TO A RECENT HUMAN CASE.

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Since its discovery in rodents by McCoy[3] in California in 1911, tularaemia has been found to have a widespread distribution in North America. The same year it was described by Pearse[12] as an insect-borne disease. Francis[1] in 1919-1920 correlated these two manifestations and to him we owe most of our knowledge of the disease. It is now known to be contracted by man either by contact with infected animals or by the bites of flies or ticks which have become carriers through biting diseased rodents prior to attacking man, or even from the excreta of these insects.

In Canada, the first human case was reported by McNabb[4] in February, 1930, from Timmins, Ontario. Several human cases have occurred since in Eastern Canada.

In British Columbia, tularaemia was first demonstrated in 1930 from a snowshoe rabbit (*Lepus americanus columbiensis* Rhoades) and the ticks it carried (*Haemaphysalis leporis palustris* Packard) taken at Vavenby, 100 miles north of Kamloops[9]. Since then, the disease has been proven in ticks (*H. leporis palustris* Packard) taken at Rayleigh, 11 miles north of Kamloops in 1934[10] and at Vavenby in 1935[11]. This tick is of very common occurrence and is the principal vector of the disease among rabbits. As it is a three-host tick, (*i.e.*, drops off its

host to moult in the larval and nymphal stages), the infection has three chances of being picked up by a tick before egg-laying. It is then hereditarily transmissible to one or more succeeding generations of ticks. So far as is known, the germ must winter mainly in the tick. The wood tick (*Dermacentor andersoni* Stiles) is an important vector of the disease in the north-western United States, but although very common in the interior of British Columbia, has not yet been incriminated here. In its first two stages it feeds on the blood of rodents and ground game birds, most of which are susceptible to tularaemia; the adult ticks then feed on man or any other large mammals by which they happen to be picked up, and may pass on the disease. Thousands of sheep have been lost through this agency in Montana and Idaho[8], and possibly some cattle in California through the Pacific Coast tick, *Dermacentor occidentalis*[7]. It is owing to its transmission through insects and ticks to man and livestock that much of the work on this disease is being done by entomologists. Deerflies (*Chrysops* species) also carry the disease, but most cases of human tularaemia have been traced to contact with infected rabbits. In January, 1931, Dr. G. A. Ootmar[5] reported a positive agglutination test made in October, 1930, of 1 in 80 dilution for the disease with serum obtained by Eric Hearle from a man in the Kootenay district whose clinical history suggested that he had had the disease following a deerfly bite on August 10, 1929. The present human case is the first in British Columbia to be diagnosed during the illness by the demonstration of a rise in titer (*i.e.*, dilution) of the serum which agglutinated *Bacterium tularense*.

On October 5, 1934 at Cherry Creek, 12 miles south-west of Kamloops, B. C., a ten-year-old girl was bitten on the side of the nose by a cat. After four days the face began to swell, the temperature rose to 103.8°, and the child was taken to the hospital in Kamloops. The temperature chart during the period in hospital showed a range from 103.8° down to 97°, often in a few hours. A rise in temperature during the day was followed by lowering to subnormal during the night, with fluctuations of the daily average every three or four days. Discharged on the thirty-second day, the child has apparently slowly recovered. During the next three or four months she suffered great lassitude with a tendency to sleep in school in the afternoons. The clinical history of the case is being reported by the attending physician, Dr. R. W. Irving, of Kamloops.

Since it was learned that, previous to the bite, the child and her associates had found a dead snowshoe rabbit in the woods and fed it to the cat, tularaemia was suspected. The clinical history also suggested this. In order to prove the tentative diagnosis, blood samples were sent to Dr. R. R. Parker, Director of the Rocky Mountain Laboratory, U. S. Public Health Service, Hamilton, Montana, who has studied tularaemia for many years and who kindly made the tests.

The first sample of the child's blood serum was submitted to Dr. Parker on October 22 and agglutinated for *B. tularense* completely in all dilutions up to 1 in 20 and partially at 1 in 40. A separate sample tested at this time by the Public Health Laboratory at Vancouver gave negative results for *Brucella abortus* and para-typhoid A and B.

The second sample was submitted to Dr. Parker on November 2, and agglutinated for *B. tularense* completely in dilutions up to 1 in 320 and partially at 1

in 640.

A third sample of the child's blood serum was tested at Kamloops on February 14, 1935 and showed *B. tularense* agglutinins in the same titer, or dilution, as the second sample. These findings were confirmed by Dr. Parker in titer of 1 in 160, partial at 1 in 320, which is not beyond a reasonable variation in technique.

When two blood samples taken a few weeks apart are positive in the same titer, as between the second and third samples above, it indicates that the patient has had the disease. When, however, one positive test is followed by a second in higher titer, as between the first and second tests in this case, it proves that the patient has had tularaemia during the period between the tests. This rise in titer of the blood serum is apparently the only satisfactory proof (except the recovery of the germ from the patient) that he is suffering from the disease at the time the tests are made.

When the glands of the child's throat began breaking down, it was decided to test the effect of the discharge upon guinea pigs. On October 22, when the first gland was drained the swabs were washed in 2 cc. saline. Two young guinea pigs, a white and a brown, were each injected subcutaneously on the abdomen with .25 cc. of this solution and the white pig was given a second similar injection in the groin. The animals acted normally for a few days, then became ill and off their feed. Both were dead by the morning of November 1. Autopsy showed small greyish-white necrotic foci on the spleens of both, and smaller by similar spots on the liver of the brown pig. The liver spotting was not noticeable in the white, but its lungs were dark and congested. Both had necrotic areas at the sites of injection. These symptoms, and the speedy death, are indicative of tularaemia.

As the above findings were accepted clinically and suitable culturing media were not available, no attempt was made to isolate the organism.

The cat whose bite caused the present infection is reported to have been sick for about a week following feeding on the dead rabbit, during which period its neck had been greatly enlarged. She completely recovered, but died February 16, 1935, following the taking of a blood sample under chloroform on February 14. When tested at Kamloops, her serum partially agglutinated *B. tularense* at 1 in 20 titer, but this was not confirmed in part of the same sample tested by Dr. Parker. It seems, however, that the semi-immunity of carnivorous animals to tularaemia must depend on some other mechanism, since such positive tests as are on record are in comparatively low titer, that is, 1 in 80[1].

A case very similar to the one under discussion is that reported by Parker and Francis[6] on infection in man from the bite of a coyote pup. In their experiments, coyotes died of eating rabbits freshly dead of tularaemia.

Green and Wade[2] have found that of eleven cases of tularaemia in Minnesota, one appeared to be due to a cat directly, and two others resulted from rabbits singled out by cats and transported to the abode of man. They mention that McCoy failed to infect cats with tularaemia in 1911 and 1912, but that in their own experiments, of five cats fed infected material, three showed signs of serious illness lasting a week, and one died on the sixth day Autopsy yielded *B. tularense* organisms in spleen and liver. Their findings, then, would show that a cat in the

woods may not only be a contact carrier of tularaemia, but may also be an infected carrier.

The writer wishes to acknowledge assistance received from Dr. A. G. Naismith of the Public Health Laboratory, Kamloops, B. C. in the inoculation of guinea pigs and in making blood tests, and from Dr. R. R. Parker of the U. S. Public Health Service, Hamilton, Montana, who gave frequent advice and made blood tests.

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STUDIES ON NORTH AMERICAN MORDELLIDAE, I. (COLEOPTERA).[1]

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This is the first of a series of papers on North American Mordellidae. It is intended that the entire family will, in time, be taxonomically covered and that keys to the members of various genera will be included.

Unless otherwise noted *types* of species hereafter described are to be found in the collection of the writer.

The following key and the subsequent descriptions of two new species is a synopsis of Section I of the genus *Mordellistena* as indicated in Smith's[2] key and includes all those forms that lack comb-like ridges on the second segment of the posterior tarsi.

Elytra entirely black, without spots ..... 1.
Elytra bicolored ..... 2.

1. Mouth parts and anterior legs ferruginous; antennae reddish-brown; length 4 mm. (Maine) ..... *frosti* Lilj.

[1]Contributions from the Entomological Laboratories of the University of Illinois, No. 177.
[2]Trans. Amer. Ent. Soc., X, 1882, p. 85.

Entirely black; length 2 mm. (Florida) ..... *erratica* Smith.

2. Basitarsi of posterior legs with a single short ridge[3] ..... 3.
Basitarsi of posterior legs with two short ridges (Fig. 3) ..... 5.

3. Maxillary palpi with apical segment spoon-shaped, pointed at apex; elytral maculation in the form of two transverse bands. (Illinois (Figs. 6, 9) .... *bifasciata* n. sp.
Maxillary palpi with apical segment triangular in shape (Fig. 5); elytral maculation in the form of spots ..... 4.

4. Elytra quadrinotate; spots subhumeral and subapical. (Fla., So. States, Ind., Ohio) ..... *bicinctella* Leconte.
Elytra binotate; spots subhumeral only. (Indiana). ..... *confusa* Blatch.

5. Elytra quadrinotate; spots subhumeral and postmedian; length 2.56 mm. (Illinois) (Fig. 7) ..... *ozarkensis* n. sp.
Elytra binotate, postmedian pair of spots wanting; length 1.5 mm. (Texas) ..... *tarsalis* Smith.

Mordellistena bifasciata n. sp.

Figures 6, 9.

Elongate, subparallel, moderately robust; color black, except for the following flavo-castaneous areas: Head, pronotum, scutellum, two broad bands on elytra, one subbasal and extending to one-third from base, the other postmedian, narrower than preceding and reaching within one-fourth of apex, antennae, mouth parts, legs (except posterior femora), mesosternum between legs, apical margin of ventral abdominal segments narrowly, apical sternite and tergum entirely; body covered with fine, short, recumbent pubescence, partaking of dermal color. Head convex; antennae 1.07 mm. long, reaching posterior coxae, segments 3, 4 short, equal; 5-10 broadened, each one-half longer than 4; apical segment of maxillary palpi enlarged, almond-or spoon-shaped, pointed at apex. Pronotum convex, broader than long (.68 x .63 mm.), sides finely margined, basal lobe distinctly truncate, slightly emarginate. Scutellum triangular. Elytra elongate, two and one-fourth times as long as broad (1.54 x .68 mm), sides parallel, apex broadly rounded. Posterior edge of metasternum broadly margined. Posterior tibiae with a single short ridge, basitarsi with one short ridge. Anal style long, attenuate to apex, three times as long as apical ventral segment (.85 x .28 mm.). Length to end of elytra 2.22 mm.; to apex of anal style 3.07 mm.

Holotype.— ♂, Forest Park, Ill., July 12, 1934 (DeLong & Ross), taken from the leaves of white pine; in the collection of the Illinois State Natural History Survey.

This species most closely approaches *bicinctella* Leconte and *confusa* Blatchley in general form, but the color and the peculiar shape of the maxillary palpi separate it at once from those members of the genus.

Mordellistena ozarkensis n. sp.

Figures 3, 7.

Elongate, subovate, moderately robust; color black, except for the following flavo-castaneous areas; Head, apical half of pronotum, a slightly oblique

[3]The subapical ridge of the posterior tibiae is excepted in these and following remarks.

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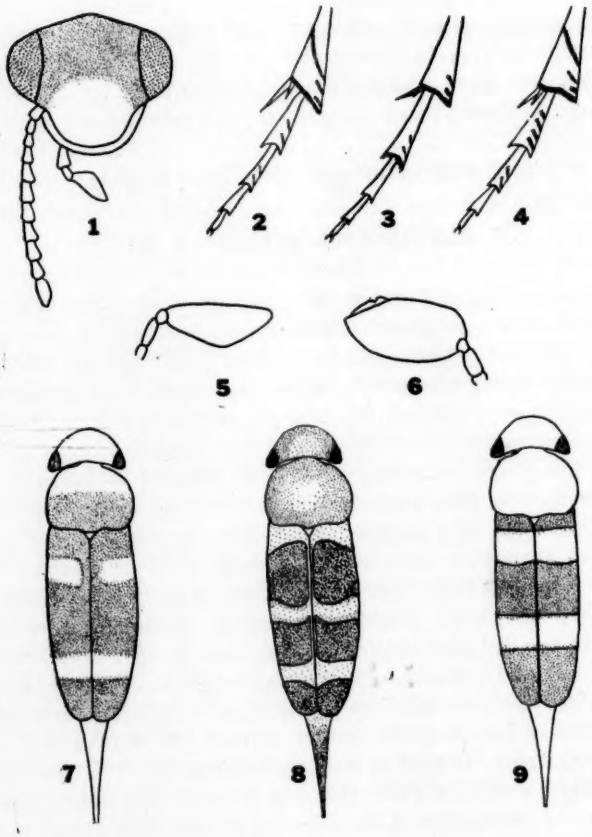

NORTH AMERICAN MORDELLIDAE

premedian band (interrupted at suture) and a transverse whole postmedian fascia on elytra, mouth parts, terminal segment of antennae, legs and two ventral abdominal segments; body covered with fine, short, recumbent pubescence, partaking of dermal color. Head convex; antennae .5 mm. long, reaching posterior coxae; segments 3, 4 short, equal; 5-10 broadened, each one-fourth longer than 3; 11 rounded, one-third longer than 10; apical segment of maxillary palpi broadened, sub-triangular. Pronotum convex, broader than long (.62 x .52 mm.), sides finely margined, basal lobe subtruncate. Scutellum subtriangular. Elytra comparatively short, twice as long as broad (1.37 x .68 mm.), sides and apex broadly rounded. Posterior edge of metasternum broadly margined. Posterior tibiae with a single short ridge, basitarsi with two short ridges. Anal style long, attenuate to apex, 2.68 times as long as the apical ventral segment (.67 x .25 mm.). Length to end of elytra 1.89 mm.; to apex of anal style 2.56 mm.

Holotype.— ♀, Eddyville, Ill., June 20, 1934 (Ray).

This species most closely resembles *bicinctella* Leconte and may be separated from that member of the genus by the additional ridge on the posterior basitarsi and the submedian position of the apical pair of elytral spots.

Mordellistena rubrofrontalis n. sp.

Figure 1.

Form elongate, subparallel; color black, except for a reddish oval spot on front of head immediately before eyes, the slightly paler antennae and two anterior pairs of legs, and the flavous spurs of posterior tibiae; surface entirely covered with fine, sericeous-golden pubescence. Antennae from .85 to 1.14 mm. long; segments 3, 4 equal, the latter broader; 5 one-half longer and much broader than 4; 6-10 equal in length to 5, but slightly narrower; 11 slightly longer than 10, spear-shaped, broadest submedially, rounded on sides and apex; maxillary palpi with terminal segment enlarged, form of an isosceles triangle, corners but little rounded. Pronotum broader than long (from .85 x .8 to 1.17 x 1.05 mm.), convex, sides finely margined, basal lobe pronounced, rounded. Scutellum triangular. Elytra elongate (from 2.34 x .94 to 2.97 x 1.25 mm.), almost two and one-half times as long as broad, sides narrowly attenuate, apices rounded. Posterior tibiae with two short ridges, first and segments of posterior tarsi with three and two ridges respectively. Anal style long, from 2.17 to 3.25 times as long as apical ventral segment, narrowly truncate at apex. Length to end of elytra 3.14-4.19 mm.; to apex of anal style 4.08-5.5 mm.

Holotype.— ♂, Miller, Ind., June 12, 1928 (Ray).

Allotype.— ♀, same data.

Paratypes.—1 ♂, 4 ♀, same data; 1 ♀ mounted on slide; paratype in collection of Illinois State Natural History Survey.

This species has much the appearance of *aspersa* Melsh., but may immediately be separated from that member of the genus by the striking reddish frontal spot of the head. In other respects it differs from *aspersa* in the broader antennal segments, the longer anal style, and the larger size.

Mordellistena tiara n. sp.

Figures 2, 5, 8.

Form elongate, subparallel; color black, except for the flavo-castaneous

six basal segments of antennae (five in ♀), the flavo-piceous anterior and intermediate legs, and the following whitish-pubescent areas: Head and thorax sparsely and three transverse bands on elytra, basal, slightly premedian, and postmedian, connected by a narrow sutural line; elsewhere pubescence partakes of dermal color. Head convex; antennae from .8 to .97 mm. long, reaching basal abdominal segment, segment 4 one-third longer than 3 in ♂, (equal to 3 in ♀), slightly broadened; 5-10 broadened, each one-half longer than 4; 11 rounded, one-fourth longer and slightly wider than 10; apical segment of maxillary palpi broadened, sub-triangular. Pronotum convex, broader than long (.62 x .57 to .8 x .68 mm.), sides finely margined, basal lobe rounded. Scutellum triangular. Elytra elongate, 2.13 times as long as broad (1.54 x .68 to 1.82 x .74 mm.), sides narrowly attenuate, apices rounded. Posterior edge of metasternum finely margined. Posterior tibiae with two oblique ridges, the anterior extending entirely across outer face, basitarsi with from two to three short ridges, second tarsal segment with two ridges. Anal style elongate, from 3 to 3.62 times as long as apical ventral segment, narrowly truncate at apex. Length to end of elytra 2.11-2.5 mm.; to apex of anal style 3.47-4.21 mm.

Holotype.— ♂, Eddyville, Ill., July 3, 1934 (Ray).

Allotype.— ♀, same locality, June 19, 1934.

Paratypes.—1 ♂, same data as holotype; 1 ♂, Sherborn, Mass., June 18, 1934 (Frost); 1 ♂, Framingham, Mass., June 5, 1930 (Frost); 2 ♂, Elizabethtown, Ill., July 8, 1935 (Ross & DeLong); 1 ♂, Zion, Ill., July 25, 1934 (Frison & Delong), taken on savanna grasses; 1 ♂, Apple River Can., State Park, Ill., July 11, 1934 (Delong & Ross); 2 ♂, 1 ♀, Castle Rock, Grand Detour, Ill., July 12, 1934 (Delong & Ross); 1 ♂, Urbana, Ill. (West collection of clover insects); *paratypes* in collections of Mr. C. A. Frost and the Illinois State Natural History Survey.

This species cannot be closely associated with any other member of the genus in our fauna. It falls into Section "C" of Smith's key and may be distinguished from these forms by the trifasciate elytra. *M. tiara* would follow *picilabris* Helm. in a systematic arrangement.

Mordellistena rufocephala n. sp.

Figure 4.

Elongate, subparallel; color black, except for the following light areas: Head rufo-castaneous, antennae and maxillary palpi flavo-castaneous (three terminal segments of former structure somewhat darker), anterior and intermediate legs and spurs of posterior tibiae brunneous; surface of body covered with cinereous pubescence, most dense on ventral surface. Head convex; antennae .98 mm. long, reaching second abdominal segment, segment 4 almost twice as long as 3; 5-9 but slightly broadened, each one-half longer than 4; 10 noticeably broader than 9, but no longer; 11 rounded, one-third longer than 10; apical segment of maxillary palpi enlarged, elongate-triangular, scalene in shape. Pronotum convex, broader than long (.68 x .65 mm.), sides finely margined, basal lobe truncate. Scutellum triangular. Elytra elongate (1.04 x .35 mm.), almost three times as long as broad, sides narrowly attenuate, apices rounded. Posterior tibiae with two oblique ridges, the anterior extending entirely across outer face; basitarsi with

four, second segment of posterior tarsi with two short, oblique ridges. Anal style elongate, 2.7 times as long as the apical ventral segment, attenuate to apex. Length to end of elytra 1.69 mm.; to apex of anal style 2.77 mm.

Holotype.— ♂, Eddyville, Ill., June 20, 1934 (Ray).

This species is most closely allied to *rufa* Lilj. and may be separated from the latter member of the genus by the unicolorous elytra, the black thorax and the much smaller size. Together with *splendens* Smith, *rufocephala* and *rufa* form a unique subdivision in the North American species of this genus, because of the combination of ridges on the posterior tibiae and tarsi.

THREE UNDESCRIBED PEDICULOIDID MITES FROM THE SOUTHERN APPALACHIANS.

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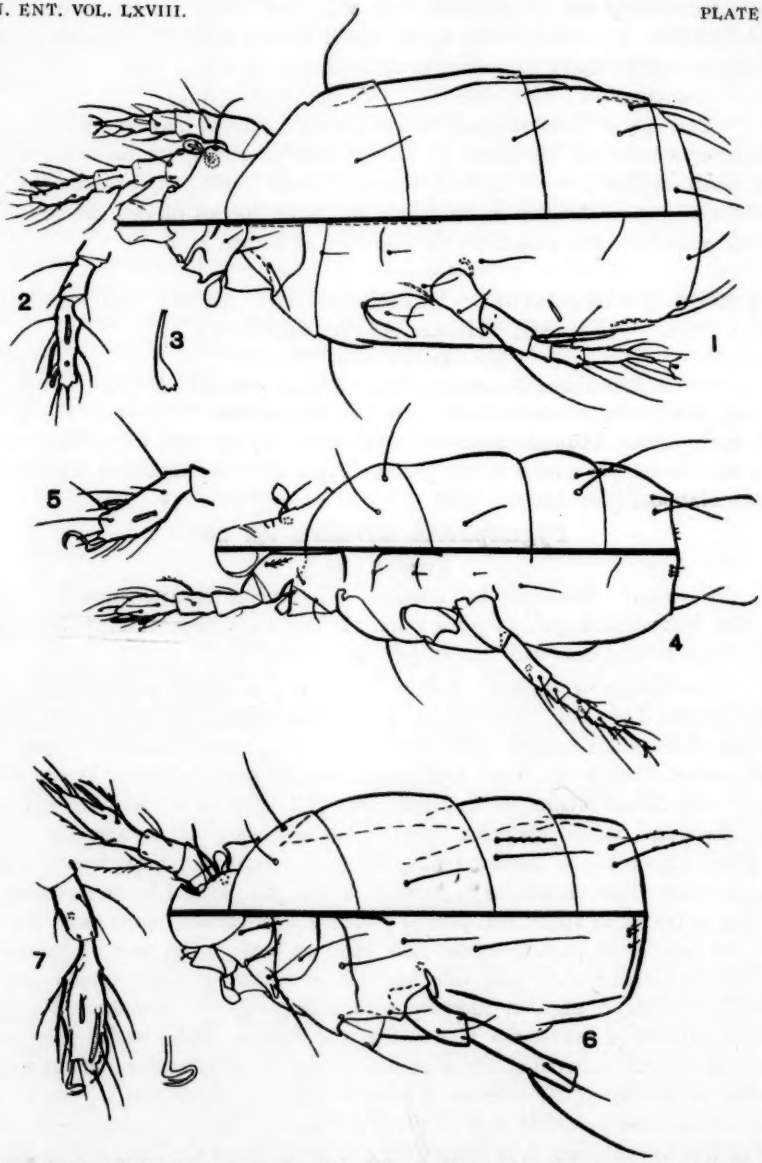
In a recent number of the Canadian Entomologist I presented a generic key to the female Pediculoididae and described a new species of Pygmephorus. I now add three more species to this genus. Types are to be deposited at the United States National Museum.

Pygmephorus silvestris sp. nov.

Figures 1 to 3

Diagnostic characters of females: All bristles simple, smooth; tarsi 1 without discernible unguis (figures 1 and 2); legs IV with two long bristles; posterior edge of abdomen with ten fairly long bristles.

Description of females: Rather colorless; size rather small, length 0.187 mm., breadth 0.087 mm.; procephalon longer than broad; prothorax rather broad; interpseudostigmatic bristles quite stout, fairly long; pseudostigmatic organ with long pedicel (figure 3), distal end curved ventromesad; scapular bristle rather long; other dorsal bristles stout; lateral pair of bristles of dorsal plate III quite long, depressed, mesal pair erect, subequal but appearing half as long and stouter in dorsal aspect due to foreshortening, while in lateral aspect the lateral bristles appear shorter than dorsal due to curve of lateral pair; lateral bristles of plate IV as long as lateral of III; mesal pair of plate IV approximate, quite long; the two pairs of bristles of posteroventral plate medium long; mesal pair of bristles of parasterna I rather short and fine, inserted in middle of plate, lateral pair inserted on posterior edge, at juncture with lateral edge of parasterna II; mesal pair of bristles of parasterna II inserted near median plane, lateral pair rather long, but normal, inserted at center of lateral edge of parasternum; lateral pair of bristles of parasterna III inserted at anterior edge of acetabulum III, mesal pair inserted far from posterior edge of plate (in figure 1 the line passing over insertion of this bristle seems to be ventral edge of dorsal plate I); I am able to discern only two pairs of bristles on parasterna IV, the mesal pair inserted between insertions of legs III; tarsi I without curved spine, with three clubs (as in figure 2), bristles fairly long; tarsi II with a short club (shorter than the tibia); all legs with simple bristles most of which are fairly long; femora IV one-and-a-half times length of tibiae IV, dorsal bristle unusually long; tibiae with an unusually long bristle.



Pygmephorus silvestris sp. nov., female, Fig. 1. Dorso ventral aspects, five of the legs omitted, procephalon extended; ratio x 440. Fig. 2. Tarsus and tibia I, lateral aspect; ratio x440. Fig. 3. Pseudostigmatic organ, lateral aspect; ratio x440.
Pygmephorus disparisetae sp. nov., female, Fig 4. Dorso ventral aspects, six of the legs omitted, procephalon not extended; ratio x264. Fig. 5. Tarsus I lateral aspect; ratio x440.
Pygmephorus formosus sp. nov., female, Fig. 6. Dorso ventral aspects, six of the legs omitted, procephalon bent under; ratio x264. Fig. 7. Tarsus and tibia I, lateral aspect; ratio x440; the unguis still further enlarged at side.

Males unknown.

Material examined: Three specimens from dry leaves of litter of oil-field grown to thirty year old pitch pines and dogwood, Bent Creek Experimental Forest, ten miles southwest of Asheville, N. Car.; taken September 20th, 1934, slide 34F4.1-4 (*cotypes*). One specimen from lowest layer of same litter, slide 34F4.3-2. Three specimens from litter of an isolated stand of forty year old short-leaf pines, surrounded by Andropogon pastures; taken October 15th, 1934, slides 34F10.2A1 and -A2. Four specimens from Andropogon sod, top of hill (Glen Bald), Bent Creek Experimental Forest; taken April 17th, 1935, slides 34F31-5, -a1 and -a4. Three specimens from Andropogon litter, top of grassy ridge (Shut-in-Ridge), Bent Creek Experimental Forest; taken May 8th, 1935, slide 34F35.1-3.

Pygmephorus disparisetae sp. nov.

Figures 4 and 5

Diagnostic characters of females: Bristles of dorsum long, of venter short; unguis of tarsi I with a single well-developed hook; pseudostigmatic organs so short as not to curve down between legs I and II; femora IV not twice length of tibiae.

Description of females: Quite colorless; size fairly large (for the genus), total length 0.246 mm., breath 0.1 mm.; prothorax well developed; it is not advisable to give relative length as this structure varies considerably in dorsal aspect, depending on angle of flexure with abdomen, sides not extended to form a prominent lobe over pseudostigmata, as is *Pygmephorus arvorum* and *Pyg. silvestris*, but extended as a slight, rectilinear extension, so that sides are rather uniformly converging; interpseudostigmatic bristles quite long (much foreshortened in figure 4), inserted on dorsal face of prothorax; a clear spot anteriad of insertion; bristles of post-thorax long; bristles of dorsal plate II relatively short and stout; mesal pair of bristles of dorsal plate III very long, the lateral pair short and stout, depressed; mesal pair of bristles of dorsal plate IV fairly long, with incurved distal end, inserted near lateral corner; lateral pair shorter, inserted on dorsal face of plate (compare this condition with that of *Pygmeophorus arvorum* and of *Pyg. silvestris*); bristles of parasterna I short but coarsely ciliate, the lateral pair inserted on lateral corner of plate; bristles of parasterna II short, inserted near edge of leg insertion, the lateral pair at center of edge; the other bristles inserted as in figure 4; posterior edge of ventral plate with three minute bristles each side of median plane; tarsi I with well-developed distal apophysis (figure 4), unguis with fairly long shaft and well formed hook, lateral face with a short club inserted slightly posteriad of middle of segment and a somewhat longer dorsolateral club inserted at distal third of segment (figures 4 and 5); tibiae I with a well-developed ciliate bristle inserted at center of mesal face; tibiae II with dorsodistal spine about two-thirds length of tarsus; legs IV slender, dorsal bristle of femora and of tibiae long but fine.

Males unknown.

Material examined: Four specimens from soil sample from old-field abandoned four years, grown to tall weeds including daisy, Melilotus, and an annual grass, eight miles southwest of Asheville on Brevard road, N. Car.; taken April 5th, 1935, slide 34F29a1. One specimen from Andropogon sod, top of bare knoll

(Glen Bald), Bent Creek Experimental Forest, N. Car.; taken April 17th, 1935, slide 34F31-4 (*holotype*).

Pygmephorus formosus sp. nov.

Figures 6 and 7

Diagnostic characters of females: Tarsi I to III, tibiae I and II, parasterna I, and dorsal plates III and IV bearing ciliate to barbed bristles; unguis I with two very sharply bent hooks; femora IV twice as long as tibiae IV with a long bristle inserted slightly distad of center of dorsal face; body bristles long.

Description of females: Rather colorless; rather large and puffy, length 0.229 mm., breadth 0.139 mm. (0.23 x 1.4 mm.); procephalon longer than broad, tapering, not extended in my material; prothorax rather narrow; interpseudostigmatic bristles quite stout, inserted anteriad of position of pseudostigmata (figure 6) quite near dorsolateral edge; anterior to it is a short, fine bristle, inserted on edge, directed laterad, anterior to this bristle is a clear oval area; mesal pair of bristles of dorsal plate I rather remote; bristles of plate II much more approximate; lateral bristles of plate III much shorter than mesal pair, stout, strongly depressed (prone), strongly barbed, the mesal pair inserted near lateral; bristles of plate IV similar to those of plate III but longer and finer (figure 6), the mesal pair appearing rather approximate when body is transversely buckled due to drying or fasting; bristles of parasterna I similar to those of *Pygmephorus arvorum;* parasterna II with three pairs of bristles, two pairs on the drawn-out lapet-like lateral ends, one pair on body of plate but rather remote, the lateral lapet bristle quite long, directed outward as in *Pyg. arvorum* but not thickened; mesal pair of bristles of parasterna III inserted near posterior edge of plate; mesal pair of bristles of parasterna IV inserted between insertion of legs IV; the pair of abdomen bristles longer than any other ventral face bristle; posterior edge of abdomen with three bristles each side of posterior aperture (figure 6); tarsi I with dorsodistal angle produced over unguis as a prominent apophysis, ventral face with three or four weakly pauciciliate bristles (figures 6 and 7), lateral face with a short and a long club (figure 7), dorsal face with a stout curved bristle, appressed close to surface of segment, unguis apparently two hooked or with a split tip; tibiae I with the usual four bristles inserted as in figures 6 and 7, the ventromesal ciliate; tarsi II with strongly ciliate bristles and a short, stout spine; tarsi III with a ciliate dorsoproximal bristle; legs IV unusually developed, tibiae IV with a long dorsoproximal bristle.

Males unknown.

Thus superficially resembling *Pygmephorus arvorum* but larger, legs IV with longer bristles, a very different unguis I and different bristle emplacements.

Material examined: Eight specimens from Andropogon sod, top of grassy hill (Glen Bald), Bent Creek Experimental Forest, ten miles southwest of Asheville, N. Car.; taken April 17th, 1935, slide 34F31-a4 (*cotypes*). Five specimens from same lot (including two females, each with one nearly spherical egg), slide 34F31-4. Three specimens from same lot, slides 34F31-5 and -a2. Two specimens from Andropogon sod, top of grassy ridge (Shut-in-ridge), Bent Creek Experimental Forest; taken May 8th, 1935, slide 34F34-8. One specimen from soil

sample (including daisy, Melilotus, and an annual grass) of tall-weed old-field, eight miles southwest of Asheville, N. Car.; taken Apri 5th 1935, slide 34F29-a2.

OBSERVATIONS ON THE MEALY BUG, *PHENACOCCUS ACERIS* SIG.

BY F. C. GILLIATT,
Annapolis Royal, N. S.

In the Canadian Entomologist, August, 1935, the writer presented a short life-history of the mealy bug, *Phenacoccus aceris* Sig. Since the preparation of the above paper, further interesting observations have been recorded.

The female nymphs emerge from the winter cocoons and disseminate over the tree to feed, considerably earlier in the spring than was originally supposed. When visiting an infested orchard near Annapolis Royal on March 20, 1935, the writer was surprised to find that the females were already feeding in small numbers on the fruit spurs. An estimate of the emergence at this date was from 4 to 5 percent of the total infestation. A few were also observed emerging from the winter cocoons and beginning to make their way to the outer limbs. These observations were made on a clear bright day about 4 p.m. At the time, it was slightly below freezing in the shade. In the sunshine the temperature was probably a few degrees above the freezing point. There was nearly a foot of snow under the trees in the orchard.

In 1936, the female mealy bugs began to emerge from hibernation at even an earlier date than the preceeding year. The first emergence was observed on March 11. This was at the beginning of a rather unusual prolonged mild period, which occurred during that month. There were a few inches of snow on the ground at the time of this observation.

It was also mentioned in the original paper that mating had not been observed and that it was not known by what means the delicate males were able to make contact with the females.

Near the middle of May 1935, it was quite evident that the females were not so numerous on the fruit spurs and smaller branches as at a somewhat earlier date. Upon closer examination it was found that some were in the slow process of crawling back toward their winter hibernating quarters on the trunk and larger limbs. Others had completed their migration and were found under the rough bark and in crevices of the trunk and larger limbs where the mature males hibernate. At this date, the males were emerging and copulation was taking place.

In 1935, the mating period was about May 15. However, the trek of the females, evidently for the sole purpose of mating, extends over a considerable period. After mating, the females again disperse over the tree and resume feeding. Oviposition does not commence until the second week in June.

AMERICAN SPECIES OF LUDIUS; THE INFLATUS GROUP*.

BY W. J. BROWN,
Ottawa, Ont.

The species considered below are commonly confused in collections under the name *inflatus* Say. They resemble one another very closely, but critical study

Contribution from the Dominion Entomological Laboratory, Annapolis Royal, N. S.
*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

of the material at hand has shown the value and constancy of the characters noted below. The most important characters are those of the antennae, noted in the first couplet of the following key, and of the aedeagus.

These species may be distinguished from all others of *Ludius* by the very broad, moderately convex body and the excavated prosternal sutures. They possess the following characters in common.

Blackish, immaculate, moderately shining, sometimes metallic, the antennae and legs sometimes paler. Body slightly less than three times as long as wide, moderately convex; the sides of the elytra parallel in basal three-fifths. Vestiture very fine, pale, very distinct above and beneath, giving the body a glaucous appearance, dense on the scutellum. Head half as wide as the pronotum, densely but not very coarsely punctate. Antenna not surpassing the apex of the posterior pronotal angle; the second segment two-thirds to three-fourths as long as and equal in width to the third; the third segment half as wide as long, two-thirds to three-fourths as wide as and equal in length to the fourth; the fourth segment one-half to three-fourths and the eleventh one-half to two-thirds as wide as long, the latter widest beyond the middle and broadly rounded at apex. Pronotum eight- or nine-tenths as long as wide, the sides rather strongly arcuate, moderately sinuate before the posterior angles; the latter rather stout and strongly carinate; punctures of the disk not very coarse, quite close at middle, dense on the sides. Elytral striae distinctly punctate; the intervals feebly convex, finely punctate and feebly subrugose. Prosternal sutures excavated anteriorly. Metasternum and abdomen finely punctate, the punctures closer on the sides.

KEY TO SPECIES

1. Antennal segments 4 to 11 very finely and densely punctulate and pubescent; segments 2 and 3 not so, with a few punctules and longer hairs; antennae slightly longer and stouter in males than in females 2
   Antennal segments 4 to 11 similar to segments 2 and 3 in sculpture and vestiture; the punctules sparse and very indistinct, the hairs sparse and moderately long; antennae similar in the sexes, the segments slightly more elongate than in either sex of the other species 3
2. Body with brassy reflections; legs reddish-yellow, the femora sometimes darker; eastern ..... 1. *inflatus* Say.
   Body not metallic; legs dark brown or black; western .... 2. *glaucus* Germ.
3. Aedeagus with the lobes more elongate and the basal piece less strongly transverse ..... 3. *callidus* n. sp.
   Aedeagus with the lobes less elongate and the basal piece strongly transverse ..... 4. *inutilis* n. sp.

1. Ludius inflatus Say.

Elater inflatus Say, 1825, Ann. Lyc. Nat. Hist. N. Y. 258; Lec. ed. I, 392.
Elater metallicus Say, loc. cit.

Length 8-12 mm.; width 2.8-4.5 mm., the females usually a little larger and a trifle more robust than males. Blackish; the body with brassy reflections, these very distinct in well preserved specimens; legs reddish-yellow, the femora sometimes darker; the vestiture with a slight yellowish cast. Antenna failing to attain the apex of the posterior pronotal angle by a distance equal to the length of

from one to two segments in the male, from two and one-half to three segments in the female, the antenna proportionally more slender in the latter sex; segments two and three sparsely punculate and with sparse hairs; segments four to eleven densely punctulate and with very closely placed, shorter hairs in addition to a few longer hairs. Punctures of the propleura not coarse, very densely placed. Aedeagus as figured, the apices of the lateral lobes more broadly rounded than in *glaucus*.

In this species, the metallic luster is much stronger, the legs are paler, and the average size is greater than in any of other species.

In his original description of the species, Say does not note the type locality. He does state that his species is synonymous with the *Elater metallicus* of Melsheimer's catalogue of the Coleoptera of Pennsylvania; consequently Pennsylvania may be considered the type locality. I have thirty-seven specimens from Pittsburgh, and State College, Pennsylvania; Indiana; New York; Clemson College, South Carolina; Massachusetts; Arnprior, Trenton, and Strathroy, Ontario; and Aylmer, Quebec.

2. **Ludius glaucus** Germ.

Diacanthus glaucus Germ., 1843, Zeit. fur Ent. IV, 76.
Hadromorphus similissimus Mots., 1859, Bull. Soc. Mosc. XXXII, 374.

Length 7.4-9.1 mm.; width 2.9-3.6 mm., the sexes similar in size and form. Black, the body without metallic luster; legs black, the tibiae and tarsi sometimes dark brown; the vestiture white. Antenna as in *inflatus*, sometimes attaining the apex of the posterior pronotal angle but usually failing to do so by a distance equal to the length of the apical segment in the male, failing to attain the apex by a distance equal to the length of one and one-half or two segments in the female. Punctures of the propleura a little coarser and less densely placed than in *inflatus*. Aedeagus as figured, the apices of the lateral lobes more or less angulate. Other characters as in *inflatus*.

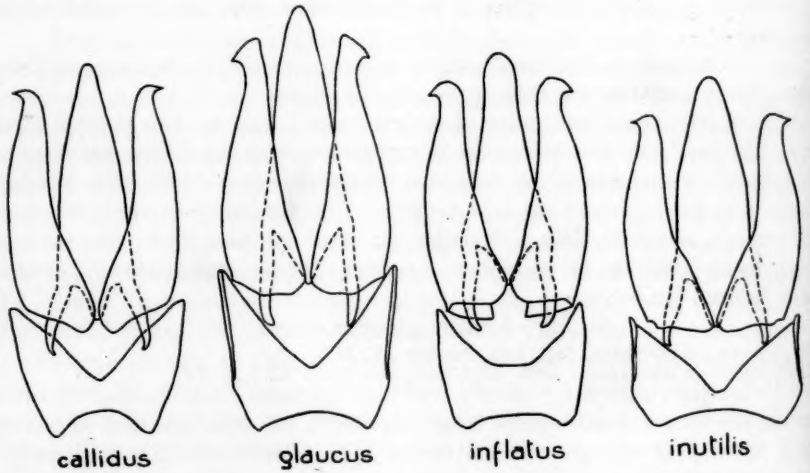
This species is distinguished readily from *inflatus* by its lack of metallic luster and dark legs. I can separate it from *callidus* only by the characters of the antennae and aedeagus. Because of its abundance, I believe the name *glaucus* should be referred to the present species instead of to the much scarcer *callidus*. The types of *glaucus* were taken in Oregon territory. It is evidently this species which has been recorded as injurious in western Oregon and Washington under the name *inflatus*. The species is represented in the collection before me by a large number of specimens, from the following localities: Moscow, Idaho; Logan, Utah; Wawawai and Tieton, Washington; Piedmont, Glenville, Woodacre, and Sequoia National Park, California; Vernon, Lumby, and Summerland, British Columbia; Magrath, Raymond, Cardston, and Medicine Hat, Alberta.

Motshoulsky's *similissimus* was based on specimens from San Francisco, California. I have considered it a synonym of *glaucus* on account of my specimen from Piedmont which is situated in the San Francisco region.

3. **Ludius callidus** n. sp.

Male. Length 8.1 mm.; width 3 mm. Black, without metallic luster; the legs reddish-brown; the vestiture white. Antenna failing to attain the apex of the posterior pronotal angle by a distance equal to the length of one and one-half

segments; the segments a little more slender than in *vernonus;* the sculpture and vestiture of all segments similar, the punctules sparse and very indistinct, the hairs sparse and rather long. Lateral lobes of aedeagus with their apices subtruncate and with their inner margins strongly curved. Other characters as in *vernonus.*



Female. Antenna as in the male.

Holotype.— ♂, Creston, B. C., May 11, 1928, (G. Stace Smith); No. 4067 in the Canadian National Collection, Ottawa.

Allotype.— ♀, same data, June 5, 1931.

Paratypes.—4 ♂, 3 ♀, same data, May, 1928 and 1931; 1 ♂, 4 ♀, Copper Mountain, B. C., June and July, 1929 and 1930, (G. Stace Smith); 1 ♂, Cedar Mt., Moscow, Idaho, June 24, 1920, (M. C. Lane).

The paratypes vary in length from 8.1 to 10.9 mm., and in both sexes the antenna fails to attain the apex of the posterior pronotal angle by a distance equal to the length of one or two apical segments. The legs vary in color from pale to dark brown.

4. **Ludius inutilis** n. sp.

Male. Length 8.2 mm.; width 3 mm. Black, not metallic, the legs reddish-brown, the vestiture white. Antenna failing to attain the apex of the posterior pronotal angle by a distance equal to the length of the two apical segments, as in *callidus.* Aedeagus with the lobes short and stout, the basal piece strongly transverse. Other characters as in *callidus.*

Holotype.— ♂, Ben Lomond, California, 1932, (L. W. Saylor); No. 4068 in the Canadian National Collection, Ottawa.

Allotype.— ♀, same data, May 25, 1932.

Paratypes.—24, same locality and collector, 1931 and 1932. The paratypes measure from 7.6 to 9.8 mm. In some, the elytra show faint violaceous reflections. The species may be distinguished from *callidus* by the characters of the aedeagus only.

OBSERVATIONS ON *PODALONIA VIOLACEIPENNIS* (LEP.) (SPHECIDAE) AND *VESPULA MACULATA* (LINN.) (VESPIDAE).

BY W. V. BALDUF,
University of Illinois.

1. Podalonia violaceipennis*

On a visit to lake Winnibigoshish, Minnesota, on August 26, 1932, my attention was attracted by numbers of this wasp engaged in dragging the mature larvae of the Notodontid moth, *Symmerista albifrons* S. and A.** over the sandy surface of the broad beach. The lake shore is about 300 feet wide at that place and composed of several distinct levels. The lower areas nearest the water are covered with low growths of willow and poplar, among which the wasps seemed to prefer to bury the paralysed caterpillars. The latter had developed on the oaks in the forest bordering the lake and several were seen crawling on the sand below the trees, presumably seeking places for pupation. The wasps doubtlessly seized their victims on the ground.

The first wasp observed dragging her prey was seen under one of the oaks and began her laborious journey northward toward the lake. In her advance, she often chanced to descend into depressions made by human feet, and usually experienced much difficulty in getting out again. But whether she emerged from the south, east or west edge of the pit, she invariably and promptly started hauling her prey northward. On her way she was accosted by another wasp of her kind that ran up from behind and attempted to steal the prey. A vigorous struggle followed at once and lasted about seven minutes, with only a momentary stop near the end. Each wasp used her mandibles to grip the veriter of the thorax of the other. Thus engaged they rolled and tossed about on their sides. No evident attempts were made to employ the stings. One of the combatants then ran away, while the other at once went astride the caterpillar and started off with it. Since the contestants were indistinguishable we can only hope that the original possessor regained her booty. Neither wasp showed any ill effects from the fray, either in physical injury or loss of vigor. In one hour this persistent creature hauled her prey 173 feet, overcoming loose sand, deep pitfalls and a vicious attack by a competing individual of her own kind.

Now she crawled up a very small scrub willow and hung her limp victim on a branchlet one inch above ground. After a few minutes of dashing and digging here and there in the sand she left the scene by flight. An hour later she returned to continue dragging her prey northward, and was thereafter seen one hundred feet further out, still plodding along. In all, she had drawn the relatively much larger and heavier caterpillar at least 275 feet, and had not yet found a satisfactory burying place.

Another wasp of this species had towed such a caterpillar at least 255 feet. Her course, like that of many others, could be traced with considerable accuracy by the tracks made by her feet and the body of the dragging prey. She was found engaged in digging early with her fore legs, throwing sand backward beneath herself, as a dog does. This wasp, like the one above, made superficial excavations here and there, and seemed long in finding conditions that exactly suited her

*Determined by Grace Sandhouse, U. S. Nat. Mus.
**Determined by Carl Heinrich, U. S. Nat. Mus.

whims. In the meantime, the somewhat bedraggled caterpillar lay on the sand among weeds a foot away. The number of tracks in the fine sand of the beach indicated that the normal destiny of many a *Symmerista* larva had been drastically changed here by *Podalonia*.

2. Vespula maculata

A mature colony of this common wasp was bagged in the night of September 29, 1931 near Urbana, Illinois, and kept under observation until October 23 when the last adults appeared in the cage. The nest consisted of four combs, which, counting from the top to the bottom; measured 7.3, 8.0, 6.5, and 4.4 inches in diameter respectively. The upper comb is the first to be constructed, beginning with a few cells constructed by the unaided queen, around which others are built as the colony grows during the season. The second is fastened by a pedicel to the center of the first, the third in the same way to the second, and the fourth to the third. Obviously each successively lower comb is started before that above is developed to its maximum size. Two types of cells are distinguishable, the white-capped cells in which wasps were pupating or from which adults had already issued, and the capless cells in different stages of incompleteness. Since the combs are enlarged by adding cells on the edges, the marginal cells are invariably the most incipient, and may be found empty or to contain eggs, whereas those adjacent to the white-capped cells in the discal area of the comb are larger and contain larvae of various sizes.

The first comb contained 595 brood cells, the second 587, the third 600 and the last 260, a total of 2042 for the entire nest. Of these, 1328 or 65 percent had been capped and mostly had yielded adult wasps, while 714 or 35 percent were open and inhabited by immature larvae or eggs, or were still too incomplete to be used for rearing brood. The proportions of capped to open cells in the four combs were 453 to 112, 522 to 65, 329 to 271 and 24 to 236, showing that the fourth comb is in most active use for brood rearing late in the season, and the third more so than the first and second.

A total of 1211 adult wasps were actually removed from the nest or cage. These proved to consist of 55 queens or 4.54 percent of the total, 250 workers or 20.62 percent and 906 or 74.13 percent males, all of which, with the exception of the old queen, developed during the current season. Thus the colony was obviously at or near its numerical maximum for the season and still remained intact as late as September 29. It seems to have been demonstrated in the past that the young newly fertilized queens are the only individuals of the colony to carry the species through the winter. All of the queens and workers in the present instance issued from the nest during the first two days following capture, while the males came out over the entire period of September 29 to October 23. A small number of cells in all the combs were inhabited by dead pupae. These were invariably situated at or near the outer margin of the area of capped cells, and always contained males. This fact suggests that males are produced only in the later part of the summer as seems to be shown also by their continued emergence long after the queens and workers. On the other hand there is evidence that the new queens matured in midseason. This is shown by the occurrence of the large queen cells principally in the discal half of the second comb, whereas none of

these were present on the first and fourth, and relatively few on the third comb. The prewinter mating of the young queens and males may take place in the nest, since the colony was still intact on the relatively late date of September 29. The fertility of the queens was assured by the fact that the males outnumbered them at the rate of seventeen to one.

The number of capped cells shows that 1328 adults, excepting a few that died in the pupal stage, developed in this nest by October 23. Since only 1225 were accounted for during and following the capture, 103 or 8.49 percent, had been lost during the season or had not returned to the nest on the night when it was bagged. Upon visiting this nest at dusk of September 28, an occasional wasp was still heard buzzing toward it, hence it is plausible that other individuals, probably workers, were detained by darkness, or became too numbed by the coolness of the night air to fly home. Nevertheless, the colony suffered a surprisingly low mortality in its existence from about June to October.

The nests of eight other colonies of *V. maculata* were found in the same wooded area in the ensuing winter of 1931-32. Only one of them was still entire in February, the rest having been demolished when the wind whipped them against adjacent parts of the supporting trees. Obviously therefore old nests are not available for use as winter quarters, and certainly are not reemployed the next season. The fact that the nests are quickly broken when deserted by the makers suggests what work, time and materials these remarkable creatures devote to keeping their homes in repair during the period of occupancy.

During the period of observation, four roaches of the species *Parcoblatta pennsylvanica* DeGeer* were seen. They cautiously poked their heads out of the aperture of the nest by day and actually emerged into the cage in the night. Doubtlessly they entered the nest, in nature, having had to climb about five feet above ground on a small elm tree to do so. They probably fed upon the dead bodies, excreta and other organic wastes of the wasps.

BOOK NOTICES.

Our Enemy the Termite, by Thomas Elliott Snyder, Senior Entomologist of the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture Ithaca, New York; Comstock Publishing Company, Inc., 1935; price $3.00.

The author of this instructive volume of 196 pages, has had the life histories of these interesting insects, also known commonly as "white ants," under study and observation for 26 years. The volume is divided into ten chapters as follows: I—Termites: What they are. II—Metamorphosis and Description of the Termite Castes. III—The Colonizing Flight. IV—Nests. V—The food of Termites. VI—Guests or Inquilines found in Termite Nests. VII—The Disturbance of the Balance of Nature by Man. VIII—Damage by Termites to the Woodwork of Buildings, Boats, Poles, Mine Props, etc. IX—Biological Control of Termites. X—Artificial Control of Termites. There is also an appendix in which information is presented regarding termite damage to buildings, etc., and an Addenda in

*Determined by A. N. Caudell, U. S. Nat. Mus.

which is given a list of the various species of termites occurring in the United States.

This volume will be found of great value not only to those specially interested in entomology, but to naturalists and the public generally. The information is presented in a very attractive manner and the 56 illustrations add considerably to the value of the text. In the United States it has been estimated that termites cause damage amounting annually to the large sum of $40,000,000. As yet, practically no damage has been caused by these insects in Canada. It is fortunate, therefore, that we have in this volume the results of Dr. Snyder's studies.

ARTHUR GIBSON.

Termites and Termite Control, edited by Charles A. Kofoid, S. F. Light, A. C. Homer, M. Randall, W. B. Hermes, and E. E. Bowe. Pages I-XXVII, and 1-795; 182 text figures, 82 tables, 1934. Published by the University of California Press, Berkeley, California. Price $5.00, Second Edition, Revised.

This volume is the revised edition of the Report of the Termite Investigating Committee of the Pacific Coast (U.S.A.), a co-operative group composed of specialists from the biological and engineering staffs of the University of California, and some of the foremost men in the lumber and building trades, railroads, electric, telephone, and telegraph companies, and chambers of commerce.

The investigations of this committee have been carried on for several years, supported by business interests directly affected by termite damage. Due to the comprehensiveness of the investigations undertaken, different phases of the work were allotted to 13 sub-committees. The reports of these sub-committees were assembled and correlated by the executive committee which also prepared Chapter 46 on "General Recommendations for the Control of Termite Damage." This book is the combined work of 35 authors, to each of whom due credit is given.

As is usual in revised editions, some minor corrections have been made. The main changes, however, are the result of research work and scientific tests completed since the publication of the first edition. The changes mainly relate to,—the production of arsine from arsenical wood-preservatives; the dependence of termites on fungi for the nitrogenous constituents of their diet; caste differentiation in termite communities; some changes regarding a preservative; the essential features of a standard biological method to test the resistivity of cellulose-containing materials; and discussion on the association of termites with arsine producing fungi. A subject index has been added.

The report contains a very complete 15 page table of contents, and is divided into 4 parts: Part I, of 32 chapters, 363 pages, deals with "Termites and their Biology"; Part II of 8 chapters, 146 pages, deals with "Chemical Investigations; Part III of 5 chapters, 59 pages, deals with "Termite Resistivity of Wood and Building Materials"; and Part IV, of 12 chapters, and bibliography, 202 pages, deals with "Prevention and Repair of Termite Damage."

This volume is an epoch making publication in the field of entomology, indicating as it does the invaluable results that may be obtained when science unites with commerce towards a common end. It will doubtless remain the final authority on termite problems for many years. For the applied entomologists of Canada, although termites are far from widely distributed in the Dominion and therefore unlikely to become of importance, this book should contain much information of practical value in the treatment of wood and the control of wood infesting insects. To others interested in entomology this volume should prove a valuable source of information, owing to its exhaustive section on termites and their biology, including such topics as climatic factors affecting termite occurrence and distribution, constitution of the colony, anatomy, and the role of protozoa and fungi in relation to termite digestion.

R. H. OZBURN.

RESEARCH NOTES

THE SYNONYMY OF THE GLADIOLUS THRIPS.

In reply to an inquiry regarding the above synonymy Dr. John B. Steinweden, Agricultural Commissioner and State Quarantine Guardian, San Francisco, California, has informed us that the synonymy of *Taeniothrips gladioli* and *T. simplex* is correct and was published as follows: H. V. Steele, "Thrips Investigation: Some Common Thysanoptera of Australia," Council for Scientific aud Industrial Research, Comm. of Australia, Melbourne, April, 1935, Pamp. 54. Dr. Steinweden received some specimens of *T. simplex* from H. V. Steele and found that they were the same as those described as *T. gladioli*. Morison described *T. simplex* in 1930 in the Bull. of Ent. Res. 21:12.

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A NEW PHASE OF INSECT DISTRIBUTION BY MEANS OF FLOOD WATERS.

The part that extensive floods over wide areas have played in the distribution of insects has been recognized for many years, but another phase of the situation was recently drawn to our attention by Mr. W. R. Lapp, in charge of the Plant Inspection Office, Windsor, Ontario, when he reported that freight cars were being moved into Canada from the recently flooded areas in the vicinity of Pittsburg, Pennsylvania. On arrival these cars were found to have from four to eight inches of soil on the floor, and as much as a thousand pounds of soil was removed from a single car. As Pittsburg is in the area infested by the Japanese beetle, Inspector Lapp arranged for the immediate examination of the soil. In the soil from one car were found several dipterous larvae, an elaterid larva, a chrysomelid larva and a termite. Although no Japanese beetle larvae were picked up, instructions were issued to all border ports that as a matter of precaution all such cars must be cleaned before entering Canada.

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NEWS AND VIEWS

CHANGE OF NAME OF TWO COMMON INSECTS OF ECONOMIC IMPORTANCE.

Attention is directed to recent changes which have been made in the scientific names of two insects of considerable economic importance. As frequent reference must necessarily be made to these species by entomologists it appears desirable to give such changes sufficient publicity so that unnecessary confusion may be reduced to a minimum.

The Prairie Grain Wireworm which was formerly known as *Ludius aeripennis* Kby., now goes by the name of *Ludius aeripennis destructor* Brown.

The name of the Mexican Bean Beetle has recently been changed from *Epilachna corrupta* Muls., to *Epilachna varivestis* Muls.

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Mailed Saturday, June 27th, 1936.